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Proceedings of the Recovery Potential Assessment of Silver Shiner (*Notropis photogenis*) in Canada

24-25 September 2012

Burlington, ON

Compte rendu sur l'évaluation du potentiel de rétablissement du méné miroir (*Notropis photogenis*) au Canada

Les 24-25 septembre 2012

Burlington (Ont.)

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Foreword

The purpose of these Proceedings is to document the activities and key discussions of the meeting. The Proceedings may include research recommendations, uncertainties, and the rationale for decisions made during the meeting. Proceedings may also document when data, analyses or interpretations were reviewed and rejected on scientific grounds, including the reason(s) for rejection. As such, interpretations and opinions presented in this report individually may be factually incorrect or misleading, but are included to record as faithfully as possible what was considered at the meeting. No statements are to be taken as reflecting the conclusions of the meeting unless they are clearly identified as such. Moreover, further review may result in a change of conclusions where additional information was identified as relevant to the topics being considered, but not available in the timeframe of the meeting. In the rare case when there are formal dissenting views, these are also archived as Annexes to the Proceedings.

Avant-propos

Le présent compte rendu a pour but de documenter les principales activités et discussions qui ont eu lieu au cours de la réunion. Il contient des recommandations sur les recherches à effectuer, traite des incertitudes et expose les motifs ayant mené à la prise de décisions pendant la réunion. Le compte rendu peut aussi faire l'état de données, d'analyses ou d'interprétations passées en revue et rejetées pour des raisons scientifiques, en donnant la raison du rejet. Bien que les interprétations et les opinions contenues dans le présent rapport puissent être inexactes ou propres à induire en erreur, elles sont quand même reproduites aussi fidèlement que possible afin de refléter les échanges tenus au cours de la réunion. Ainsi, aucune partie de ce rapport ne doit être considérée en tant que reflet des conclusions de la réunion, à moins d'indication précise en ce sens. De plus, un examen ultérieur de la question pourrait entraîner des changements aux conclusions, notamment si l'information supplémentaire pertinente, non disponible au moment de la réunion, est fournie par la suite. Finalement, dans les rares cas où des opinions divergentes sont exprimées officiellement, celles-ci sont également consignées dans les annexes du compte rendu.

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SUMMARY

A regional science peer-review meeting was held on 24-25 September 2012 in Burlington, Ontario. The purpose of the meeting was to assess the recovery potential of Silver Shiner (*Notropis photogenis*) based on the 27 steps outlined in the Fisheries and Oceans Canada (DFO) national Recovery Potential Assessment (RPA) frameworks. The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) has designated Silver Shiner as Threatened (May 2011). It is currently listed on Schedule 3 of the *Species at Risk Act* (SARA) as Special Concern. The Science Advisory Report resulting from the assessment will provide the information and scientific advice required for the Department to meet various requirements of the *Species at Risk Act* (SARA) for this species including listing decisions, authorizations to carry out activities that would otherwise violate the SARA and development of recovery strategies. Meeting participants included experts from DFO, Halton Region Conservation Authority, Upper Thames River Conservation Authority, and the Ontario Ministry of Natural Resources.

This proceedings report summarizes the relevant discussions from the peer-review meeting and presents revisions to be made to the associated research documents. The Science Advisory Report and the supporting Research Documents, resulting from this advisory meeting, are published on the DFO Canadian Science Advisory Secretariat Website at http://www.dfo-mpo.gc.ca/csas-sccs/index-eng.htm.

SOMMAIRE

Une réunion régionale d'examen scientifique par les pairs a eu lieu les 24 et 25 septembre 2012 à Burlington, en Ontario. L'objectif de cette réunion était d'évaluer le potentiel de rétablissement du méné miroir (*Notropis photogenis*) d'après les 27 étapes présentées dans le cadre d'évaluation du potentiel de rétablissement (EPR) de Pêches et Océans Canada (MPO). Le Comité sur la situation des espèces en péril au Canada (COSEPAC) a désigné le méné miroir comme étant menacé (mai 2011). À l'heure actuelle, cette espèce est inscrite à l'annexe 3 de la *Loi sur les espèces en péril* (LEP) en tant qu'espèce préoccupante. L'avis scientifique découlant de l'EPR fournira les renseignements et l'avis scientifique dont le Ministère a besoin pour respecter les diverses exigences de la *LEP* à l'égard de cette espèce, ce qui comprend les décisions relatives à l'inscription et le fait de permettre des activités qui seraient normalement contraires aux interdictions prévues dans la LEP et à l'élaboration de stratégies de rétablissement. On comptait parmi les participants des experts du MPO, de l'Office de protection de la nature de la région de Halton, de l'Office de protection de la nature de la rivière Thames et du Ministère des richesses naturelles de l'Ontario.

Le présent compte rendu résume les discussions pertinentes de la réunion d'examen par les pairs et présente les révisions qui seront apportées aux documents de recherche connexes. L'avis scientifique et les documents de recherche à l'appui découlant de cette réunion de consultation sont publiés sur le site Web du Secrétariat canadien de consultation scientifique du MPO à l'adresse suivante : http://www.dfo-mpo.gc.ca/csas-sccs/index-fra.htm.

INTRODUCTION

In April 1983, the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) designated Silver Shiner as Special Concern. The status was re-examined in April 1987 and was maintained as Special Concern. The status was once again examined in May 2011 when it was re-designated as Threatened. The reason for designation was that this species was found in fewer than 10 locations and demonstrated a small area of occupancy. Silver Shiner was subsequently added to Schedule 3 of the *Species at Risk Act* (SARA).

The purpose of the meeting, as described in the Terms of Reference (Appendix 1), was to assess the recovery potential of Silver Shiner. The RPA is a science-based peer review process that assesses the current status of the species by addressing the 27 points in the national frameworks outlined in the Revised Protocol for Conducting Recovery Potential Assessments (DFO 2007a, b). The current state of knowledge about habitat requirements, threats to both habitat and Silver Shiner, and measures to mitigate these impacts, is included in the Science Advisory Report. A peer-review meeting was held at the Canadian Centre for Inland Waters, Burlington, Ontario, from 24-25 September 2012 to discuss the Silver Shiner RPA.

Meeting participants included Fisheries and Oceans Canada, Halton Region Conservation Authority, Upper Thames River Conservation Authority, and the Ontario Ministry of Natural Resources (Appendix 2). The meeting followed the agenda outlined in Appendix 3.

This proceedings report summarizes the relevant discussions from the peer-review meeting and presents revisions to be made to the associated research documents. The Research Documents (Bouvier and Mandrak 2012; Young and Koops 2012) provide information on the working papers presented at the workshop; the Science Advisory Report summarizes the current understanding of the distribution and habitat requirements of this species, along with recovery targets and times to recovery, while considering various management scenarios (DFO 2012).

DETAILED DISCUSSION

The meeting co-chair provided the participants with an introduction to the SARA listing process. He explained how the RPA would be used, as well as the objectives of the meeting. Two draft research documents were developed by DFO and provided to participants in advance of the meeting. The draft research documents were the basis for discussion and participants were encouraged to add to or change the material as needed to ensure that the best, most accurate information was included.

SPECIES DESCRIPTION

Presenter: Lynn Bouvier

The presentation included a description of Silver Shiner, its growth rate, diet, and genetic research that has been conducted on Silver Shiner and three related species: Common Shiner (*Luxilus cornutus*), Striped Shiner (*L. chrysocephalus*), and Rosyface Shiner (*Notropis rubellus*).

The presenter noted that the age interpretation of Silver Shiner has never been validated. This fact posed challenges for modeling the recovery potential.

POPULATION STATUS

Presenter: Lynn Bouvier

The presentation on population status included population distribution, abundance and trajectory for all Silver Shiner populations, as well as the certainty associated with each of these characteristics.

There was some discussion surrounding the impact of dams on mobility and the isolation of populations in the Thames and Grand rivers. The question was raised as to whether the maps of the rivers should be segmented where dams were located, which would affect the assessment of population status as well as threats. Because the dams did not present barriers to gene flow, it was decided to regard Silver Shiner throughout a watershed as a single population. The assessments, which had divided a watershed into two populations based on their location relative to the dams, would be redone.

The presenter asked a participant if sampling had been done on the Thames River, south of St. Marys. The participant confirmed that it had been done and agreed to give the presenter the records.

In the discussion of Sixteen Mile creek, the presenter asked a participant if sampling had been conducted in the area between the QEW and Dundas Street. The presenter expressed a concern that the area had not been well sampled, to which the participant replied that there are access issues in the area. The presenter noted that this gap in sampling should be noted in the document to be the focus of future sampling efforts.

The participants then reviewed the population status tables while considering the decision to treat the Grand and Thames rivers as single populations. There was some discussion surrounding sampling methods. Participants noted that, because sampling was limited, it was difficult to calculate and compare densities with certainty.

The participants decided to revise the population status table so that the Thames River was listed as hosting one population of Silver Shiner with medium abundance and a stable trajectory. The population status was listed as "fair". The Grand River had already been listed as a single population in the table, and so was not changed.

A participant also noted that there was a slow leak of diesel fuel from a pipeline from Montreal that had gone undiscovered until 2009. Another participant suggested adding this point to the list of threats.

HABITAT REQUIREMENTS

Presenter: Lynn Bouvier

The presentation included a description of Silver Shiner's life cycle and the habitat requirements for four life stages: spawning, egg to juvenile, juvenile, and adult.

During the discussion of adult habitat requirements, a participant mentioned new data regarding stream gradients that had not been included in the presentation. The participant agreed to provide the presenter with that data.

Another participant asked if the presenter had information on flashiness. The presenter did not, so the participant offered to send contact information for the Grand River Conservation Authority, who could potentially provide some insight.

During the discussion of spawning a participant noted that the temperature of the water, but not the season in which Silver Shiner spawn (spring), had been listed for the identification of critical habitat. The presenter agreed to add that information to Table 4.

The review of habitat attributes for Silver Shiner in the egg to juvenile stage highlighted the fact that there is very little information on Silver Shiner in this life stage. A participant asked if egg to juvenile should be a priority in the schedule of studies; the presenter confirmed that it should.

During the discussion of juvenile Silver Shiner a participant pointed out that the habitat, which had been listed as the same as that of the adult, might be qualified as having some overlap with adult habitat, rather than being identical. The presenter agreed to make that change and added that there was no further information on juvenile habitat.

There was considerable discussion around Silver Shiner habitat flow rates of and the presence of Silver Shiner in riffles, runs and pools. The existing literature and recent data gave very different accounts of these two habitat descriptors. The known literature on this species only provided riffles and pools as habitat occupied by Silver Shiner. The group decided that this description may simply have omitted runs in their description because there was a discrepancy on what individuals refer to when discussing riffles, runs, and pools. The group decided that it was best to include 'runs' in the description of the features so these areas would not be exclude in the delineation of critical habitat.

Another concern of the group was the use of qualitative descriptors for flow (e.g., slow, moderate, fast). The presenter noted that past data had only qualitative flow observations, and it was decided to include this as a knowledge gap and the quantitative assessment of flow should be included in the schedule of studies.

It was then decided that descriptions of the water bodies themselves were more important than descriptions of flow, and so the former was emphasized over the latter.

In the existing literature runs had not been included as a feature of Silver Shiner habitat; however, the participants agreed that they should be. It was stated that the reason for the omission may have been varying interpretations of the terminology.

A participant noted that the correlation provided in the final feature column refers to the smaller range provided in the 'optimal' habitat, and not to the new range created by creating a habitat envelope. The latter portion, referring to the correlations should be removed. The presenter agreed to make the change.

Another participant asked about the presence of Silver Shiner in Fanshawe Lake and how to incorporate the water body into the habitat description, if at all. After some debate the group decided that, because the last reference from that water body was from 1988, and because the lake population was an anomaly, the water body likely was not optimal habitat.

The question was raised as to whether or not to include turbulent areas below dams in the attributes for the identification of critical habitat. It was decided that, because dams are human-made, they would not be considered in the delineation of Silver Shiner critical habitat.

During the discussion of substrate, a participant noted that no studies had been conducted to identify Silver Shiner's habitat preference; the habitat descriptions only covered where Silver Shiner had been sampled. The participant continued by saying that the group did not know what

optimal habitat conditions would be for Silver Shiner and suggested that a study of the existing DFO data be done. In the meantime, the word "optimal" would be removed from the substrate description and Silver Shiner's preference would be listed as a knowledge gap.

During the discussion of vegetation a participant asked if it was possible to give a definitive statement about areas that the fish avoid, as opposed to the phrase "may selectively avoid." Another presenter offered to return to the DFO data to see if a conclusion could be reached. The participant suggested that this conclusion not be listed among the attributes for the identification of critical habitat. The presenter proposed instead to include it in the broader description.

RECOVERY POTENTIAL MODELING
Presenter: Jennifer Young

The presentation on recovery potential modeling addressed life cycle and parameter estimates, model sensitivity, recovery targets, current abundance estimates, and risk of extirpation, as well as key uncertainties and science advice on allowable harm.

The discussion of recovery targets included recovery target approaches, minimum viable population (MVP) criteria, the selection process for MVP criteria, the effect of catastrophes, extinction thresholds, and habitat targets.

There was some discussion surrounding the effect of catastrophes on Silver Shiner's MVP; however, no changes were made to the research document.

During the discussion of available habitat, a participant raised the concern that available habitat was not necessarily good quality habitat. Another participant said that this issue should be identified as a knowledge gap in the research document.

The presentation highlighted the difficulties that arose from conflicting age interpretation results. The presenter noted that this was the most important knowledge gap in the assessment because it had a direct impact on the calculation of the risk of extirpation.

In the calculation of fecundity, the presenter had had to use Emerald Shiner (*Notropis atherinoides*) data as a substitute for Silver Shiner data. Comparisons of egg diameter between the two species could confirm whether or not the fertility had been overestimated. A participant contacted an outside source for this information. Later in the meeting the presenter confirmed that egg diameter for the two species was similar; therefore, the Emerald Shiner estimates may be used.

There was some discussion surrounding the determination of allowable harm. However, no changes were made to the research document.

THREAT STATUS
Presenter: Lynn Bouvier

The presentation on threat status overviewed the likelihood and impact of threats, as well as the certainty associated with threat impact.

It was established that threat likelihood (TLH) would be categorized as "known" (K), "likely" (L), "unlikely" (U), or "unknown" (UK); threat impact (TI) would be categorized as "high" (H), "medium" (M), "low" (L), or "unknown" (UK). The certainty associated with threat impact (C)

would be categorized as 1, derived from causative studies; 2, derived from correlative studies; or 3, expert opinion.

Grand River

There was an extended conversation about the impact of turbidity and sediment loading on Silver Shiner, particularly in the Grand River. TI was changed from H to M because it is less influenced by habitat changes than the sites of the other populations.

A participant noted that manure was listed under both "contaminants and toxic substances" and "nutrient loading." It was agreed that the explanation for this decision would be included in the research document.

There was some discussion surrounding barriers to movement in the Grand River. However, no changes were made as a result of this conversation.

During the overview of exotic species and disease in the water body, the presenter noted that there were no data on the impact of disease on Silver Shiner, and for this reason decided to remove the word from the heading.

A participant noted that exotic species [Brown Trout (*Salmo trutta*) and Rainbow Trout (*Oncorhynchus mykiss*)] exist in the Grand River. The TLH was changed from L to K, and it was agreed that a note would be added to the research document explaining that Rainbow Trout are a less piscivorous fish than Brown Trout. Walleye (*Sander vitreus*) were to be removed from the list of exotic species.

It was also noted that Brown Trout were being stocked in place of Walleye, and that this might change the rate of predation. Another participant proposed that this point be flagged in the research document for future analysis of stocking.

There was some discussion surrounding baitfish harvesting and its impact on Silver Shiner; a participant contacted an outside source for input; the source confirmed that the participants' information was accurate.

After some discussion of water management and its potential impact on Silver Shiner, the category of flow management was added to the list of threats. It was given a TLH of K and a TI of M.

A participant mentioned that discussions had taken place around whether or not to install a pipe in the Region of Waterloo. The presenter offered to look for information on that topic.

Thames River

In the review of the Thames River, the participants agreed to change the TI of turbidity and sediment loading to M, based on the conversation the group had had about the Grand River.

A participant stated that the number of dams listed for the lower Thames River seemed high; the presenter agreed to look up and update the data.

In the review of exotic species in the Thames River a participant said that Brown Trout can be found in that river, but in smaller numbers than are found in the Grand. The trout were considered unlikely to jeopardize the Silver Shiner population. The TLH was changed from U to L and the TI from M to L.

Another participant noted that Round Goby (*Neogobius melanostomus*) could prey on Silver Shiner eggs; it was agreed to mention the Round Goby as a potential threat, should it enter the Thames River.

Flow management was added to the list of threats; it was given a TLH of K and a TI of M.

In the discussion of barriers to movement a participant suggested that log jams resulting from land use be noted as a potential concern. This was noted and the presenter agreed to add it to the research document.

In the discussion of exotic species it was again stated that the potential threat of Round Goby should be added to the research document. The participant then added that Sea Lamprey might create nest competition; this fact was added to the research document as a knowledge gap.

Bronte Creek

In the discussion of Bronte Creek it was asked whether the water body was treated to control Sea Lamprey; a participant responded in the affirmative. This information will be added to the research document.

Incidental harvest of Silver Shiner by the baitfish industry was highlighted as potential threat for this species. A participant noted that the document failed to discuss the potential of anglers harvesting baitfish for their personal use, as it only discussed commercial baitfish harvesting. It was decided to add a note about angler self-harvest in rural areas, which is common. The TLH was kept as L and the TI was kept as L.

The participants discussed flow management of Bronte Creek and decided to give the category a TLH of L and a TI of M.

One participant raised the issue of flashiness in river systems, with another adding that problems with storm water management are increasing over time. The participant volunteered to check for records of increased flashiness.

Sixteen Mile Creek

During the discussion of Sixteen Mile Creek, the presenter proposed changing the TI of turbidity and sediment loading from H to M, based on previous conversations on the subject. The rest of the participants agreed with the change.

The participants discussed the flow management of Sixteen Mile Creek, particularly water taking by local golf courses. The TLH was listed as K and the TI as H. The presenter also offered to look up information on permits to take water.

Overall Threats

In the review of overall threats to Silver Shiner populations, the presenter proposed to change the definitions of widespread and local threats to threats affecting two or more locations. The number of locations was changed to two from three because only four populations exist.

Based on previous conversations, it was decided that barriers would be changed from a local to a widespread threat, and water management would be added to the list.

REVIEW OF PROJECTS AND ACTIVITIES IN SILVER SHINER HABITAT

Presenter: Dave Balint

The review of projects and activities summarized all works, projects and activities that took place in Silver Shiner habitat from 2009-2011. Participants discussed whether these numbers were likely to increase, decrease, or remain the same in the future. Standard methods of mitigation were reviewed, and possible alternatives and new methods were discussed.

After considerable discussion it was agreed that all works, projects and activities were likely to remain the same in all four water bodies.

During the discussion of mitigation options, a participant pointed to the Draft Guidance for Development Activities in Redside Dace Protected Habitat (OMNR 2011) as a resource for Silver Shiner mitigation suggestions. No other feasible mitigations were suggested during the discussion.

PATHWAYS OF EFFECT & NON-HABITAT RELATED THREATS

Presenter: Lynn Bouvier

The presentation addressed the Pathways of Effect (PoE), alternatives to activities which cause harm to Silver Shiner, and methods of mitigating harmful effects.

In the discussion of exotic species, targeted education of resource users (e.g., fisheries managers) the removal of barriers and the enforcement of existing regulations were given as potential mitigation options.

In the discussion of incidental harvest, enhanced enforcement of baitfish regulations was given as a potential mitigation option. No other suggestions were made.

SOURCES OF UNCERTAINTY

Presenter: Lynn Bouvier

The presentation addressed sources of uncertainty related to population structure, habitat, recovery potential modeling, and threats to Silver Shiner.

A participant suggested adding the Saugeen River to the list of sites for future targeted sampling. The presenter agreed to do so.

In the discussion of sources of uncertainty surrounding threats, a participant suggested adding salinity to the list of physiological parameter limits that need to be determined. The other participants agreed.

It was also decided to highlight the need to evaluate the impact of Brown Trout on Silver Shiner populations. No further additions were made to the research document.

TERMS OF REFERENCE REVIEW

Presenter: Nicholas Mandrak

The terms of reference included assessing population status, assessing uses of its habitat, determining the scope for management to facilitate recovery, determining scenarios for mitigation and alternatives to activities, and assessing allowable harm as it relates to Silver Shiner populations in Canada.

1. Evaluate present status for abundance and range and number of populations.
   - The presenter stated that the point was covered adequately during the meeting.

2. Evaluate recent species trajectory for abundance (i.e., numbers and biomass focusing on mature individuals) and range and number of populations.
   - The group covered this point to the best of their ability during the discussion of population status, using expert opinion to inform their conclusions.
   - The participants weren't able to assess trajectory due to a lack of data; however, they qualitatively evaluated populations where possible.

3. Estimate, to the extent that information allows, the current or recent life-history parameters (total mortality, natural mortality, fecundity, maturity, recruitment, etc.) or reasonable surrogates; and associated uncertainties for all parameters.
   - The group covered this point to the best of their ability during the discussion of recovery potential modeling. The lack of data limited their ability to do so.
   - In the presentation the participants identified the uncertainties related to the estimates.

4. Estimate expected population and distribution targets for recovery, according to DFO guidelines (DFO 2005, and 2011).
   - The participants covered targets for recovery to the best of their abilities during the discussion of recovery potential modeling.
   - They did not discuss the number of populations required for recovery because of a lack of data.
   - A participant noted that there are fewer populations within the native range than would be required for downlisting under COSEWIC.
   - The participant noted that genetic analysis may provide further insight into whether there are more than four populations within the identified watersheds (however, more populations did not equate to decreased risk of extinction).

5. Project expected population trajectories over three generations (or other biologically reasonable time), and trajectories over time to the recovery target (if possible to achieve), given current parameters for population dynamics and associated uncertainties using DFO guidelines on long-term projections (Shelton *et al.* 2007).
   - Uncertainties around population growth rates made it impossible to project population trajectories.

6. Evaluate residence requirements for the species, if any.
   - The participants did not cover this topic previously in the meeting.
   - The presenter discussed the residence of the SS and noted that there is a knowledge gap surrounding whether or not the fish builds its own nests.
   - The participants agreed to add this topic to the list of research needs.

7. Provide functional descriptions (as defined in DFO 2007b) of the required properties of the aquatic habitat for successful completion of all life-history stages.
   - This point was covered adequately during the discussion of habitat requirements.

8. Provide information on the spatial extent of the areas that are likely to have these habitat properties.
   - The participants covered known and suspected habitat with estimated areas during the discussion of population status.

- Participants agreed to review their estimation process to provide the required information.

9. Identify the activities most likely to threaten the habitat properties that give the sites their value, and provide information on the extent and consequences of these activities.
   - The participants identified but did not rank the threats during the discussion of threat status.
   - The group agreed that information is limited to a point where ranking is not possible.

10. Quantify how the biological function(s) that specific habitat feature(s) provide to the species varies with the state or amount of the habitat, including carrying capacity limits, if any.
   - The participants covered this point in a general sense in the discussion of habitat requirements – specifically the table of functions, features and attributes of SS habitat.
   - The group agreed that limited information prevented the quantification of biological functions.

11. Quantify the presence and extent of spatial configuration constraints, if any, such as connectivity, barriers to access, etc.
   - The participants discussed the topic extensively during the review of population status.
   - It was agreed that the text would provide adequate information for decision-making, but participants could not quantify the presence of constraints.

12. Provide advice on how much habitat of various qualities / properties exists at present.
   - The participants were able to give advice on how much habitat exists, but not the quality of habitat.
   - They identified quality of habitat as a source of uncertainty during the discussion of recovery potential modeling.

13. Provide advice on the degree to which supply of suitable habitat meets the demands of the species both at present, and when the species reaches biologically based recovery targets for abundance and range and number of populations.
   - The participants evaluated the supply and demand of habitat during the discussion of recovery potential modeling.
   - They had to use a broad definition of "suitable habitat" because of limited knowledge.
   - They weren't able to provide a number of populations because of scientific uncertainty.

14. Provide advice on feasibility of restoring habitat to higher values, if supply may not meet demand by the time recovery targets would be reached, in the context of all available options for achieving recovery targets for population size and range.
   - The participants did not provide this advice because they needed a more detailed understanding of the available habitat.
   - They reiterated that they had identified quality of habitat as a source of uncertainty previously during the meeting.

15. Provide advice on risks associated with habitat "allocation" decisions, if any options would be available at the time when specific areas are designated as critical habitat.
   - The participants did not provide this advice because more information about the quality of habitat was required.
   - A participant noted that they had provided some information to help others decide whether or not one can allocate habitat to begin with.

16. Provide advice on the extent to which various threats can alter the quality and/or quantity of habitat that is available.
    - The participants discussed how threats can affect habitat, but not the extent to which they can affect it, in the review of threat status.

17. Assess the probability that the recovery targets can be achieved under current rates of parameters for population dynamics, and how that probability would vary with different mortality (especially lower) and productivity (especially higher) parameters.
    - Uncertainty surrounding population growth rates made the assessment impossible.

18. Quantify to the extent possible the magnitude of each major potential source of mortality identified in the pre-COSEWIC assessment, the COSEWIC Status Report, information from DFO sectors, and other sources.
    - In the discussion of threat status, the participants covered this point generally by identifying the magnitude and impact of threats.

19. Quantify to the extent possible the likelihood that the current quantity and quality of habitat is sufficient to allow population increase, and would be sufficient to support a population that has reached its recovery targets.
    - The discussion of recovery potential modeling provided information that could be used to quantify the likelihood of population increase.
    - The participants identified uncertainty surrounding specific habitat and the quality of habitat required by SS.

20. Assess to the extent possible the magnitude by which current threats to habitats have reduced habitat quantity and quality.
    - The participants did not have the data required to make the assessment.

21. Using input from all DFO sectors and other sources as appropriate, develop an inventory of all feasible measures to minimize/mitigate the impacts of activities that are threats to the species and its habitat (steps 18 and 20).
    - During the discussion of pathways of effect the participants mapped threats to the mitigation guide.
    - It was noted that they also discussed mitigations for exotic species (e.g. bait harvesting).

22. Using input from all DFO sectors and other sources as appropriate, develop an inventory of all reasonable alternatives to the activities that are threats to the species and its habitat (steps 18 and 20).
    - This topic was covered in same manner as point 21.

23. Using input from all DFO sectors and other sources as appropriate, develop an inventory of activities that could increase the productivity or survivorship parameters (steps 3 and 17).
    - The participants discussed this topic during the review of project and activities in SS habitat, as well as the review of pathways of effect; however, they did not develop an inventory because of uncertainty around modeling and understanding of habitat.

24. Estimate, to the extent possible, the reduction in mortality rate expected by each of the mitigation measures in step 21 or alternatives in step 22 and the increase in productivity or survivorship associated with each measure in step 23.
    - The participants did not make this estimate for the same reasons as point 23.

25. Project expected population trajectory (and uncertainties) over three generations (or other biologically reasonable time), and to the time of reaching recovery targets when recovery is feasible; given mortality rates and productivities associated with specific scenarios identified for exploration (as above). Include scenarios which provide as high a probability of survivorship and recovery as possible for biologically realistic parameter values.
    - The participants did not make this projection because of the uncertainty around modeling.
    - However, a participant noted that DFO has information that can be used for projections when more data is available.

26. Recommend parameter values for population productivity and starting mortality rates, and where necessary, specialized features of population models that would be required to allow exploration of additional scenarios as part of the assessment of economic, social, and cultural impacts of listing the species.
    - A participant confirmed that they could identify which parameters not to use from the recovery potential modeling.

27. Evaluate maximum human-induced mortality which the species can sustain and not jeopardize survival or recovery of the species.
    - The participants could not fully evaluate mortality because of a lack of confidence in population data.
    - However, a participant noted that the modeling indicates which parameters populations are most sensitive to.

A participant asked for clarification on allowable harm. Another explained that, due to a lack of data, specific population numbers could not be offered. However, the researchers could state that harm should be avoided before the first spawn. Following that first spawn, adults should still be protected.

The author stated that she would modify the documents from the meeting in accordance with the group's comments. The participants would review the changes before the final draft was submitted.

REFERENCES

Bouvier, L.D. and N.E. Mandrak. 2012. Information in support of a Recovery Potential Assessment of Silver Shiner (*Notropis photogenis*) in Canada. DFO Can. Sci. Advis. Sec. Res. Doc. 2012/130. v + 32 p.

DFO. 2007a. Revised protocol for conducting recovery potential assessments. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2007/039.

DFO. 2007b. Documenting habitat use of species at risk and quantifying habitat quality. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2007/038.

DFO. 2012. Recovery Potential Assessment of Silver Shiner (*Notropis photogenis*) in Canada. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2012/068.

OMNR (Ontario Ministry of Natural Resources). 2011. DRAFT Guidance for development activities in Redside Dace protected habitat. Peterborough, Ontario. ii + 42 p. [http://www.mnr.gov.on.ca/groups/lr/@mnr/@species/documents/document/stdprod_082290.pdf]

Young, J.A.M. and M.A. Koops. 2012. Recovery potential modelling of Silver Shiner (*Notropis photogenis*) in Canada. DFO Can. Sci. Advis. Sec. Res. Doc. 2012/131. iv + 30 p.

APPENDIX 1. Terms of Reference

Recovery Potential Assessment of Silver Shiner (*Notropis photogenis*)

Regional Peer Review Meeting – Central and Arctic Region

September 24-25, 2012
Burlington, ON

Co-Chairpersons: Lynn Bouvier and Nicholas Mandrak

Context

When the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) designates aquatic species as threatened or endangered, Fisheries and Oceans Canada (DFO), as the responsible jurisdiction under the *Species at Risk Act* (SARA), is required to undertake a number of actions. Many of these actions require scientific information on the current status of the Silver Shiner threats to its survival and recovery, and the feasibility of its recovery. Formulation of this scientific advice has typically been developed through a Recovery Potential Assessment (RPA) that is conducted shortly after the COSEWIC assessment. This timing allows for the consideration of peer-reviewed scientific analyses into SARA processes including recovery planning.

The Silver Shiner was originally assessed as Special Concern by COSEWIC in 1983 and 1987. In May 2011, it was re-examined by COSEWIC and was designated as Threatened. Silver Shiner is currently listed as Special Concern on Schedule 3 of SARA. The recovery potential assessment will support the update status report, recovery strategy, permitting, and identification of critical habitat.

In support of listing recommendations for this species by the Minister, DFO Science has been asked to undertake an RPA, based on the National Frameworks (DFO 2007a and b). The advice in the RPA may be used to inform both scientific and socio-economic elements of the listing decision, as well as development of a recovery strategy and action plan, and to support decision-making with regards to the issuance of permits, agreements and related conditions, as per section 73, 74, 75, 77 and 78 of SARA. The advice generated via this process will also update and/or consolidate any existing advice regarding this species.

Objectives

- To assess the recovery potential of Silver Shiner (*Notropis photogenis*)

Assess current/recent species/status

1. Evaluate present status for abundance and range and number of populations.
2. Evaluate recent species trajectory for abundance (i.e., numbers and biomass focusing on matures) and range and number of populations.
3. Estimate, to the extent that information allows, the current or recent life-history parameters (total mortality, natural mortality, fecundity, maturity, recruitment, etc.) or reasonable surrogates; and associated uncertainties for all parameters.
4. Estimate expected population and distribution targets for recovery, according to DFO guidelines (DFO2005).
5. Project expected population trajectories over three generations (or other biologically reasonable time), and trajectories over time to the recovery target (if possible to

achieve), given current parameters for population dynamics and associated uncertainties using DFO guidelines on long-term projections (Shelton et al. 2007).
6. Evaluate residence requirements for the species, if any.

Assess the Habitat Use

7. Provide functional descriptions (as defined in DFO 2007b) of the required properties of the aquatic habitat for successful completion of all life-history stages.
8. Provide information on the spatial extent of the areas that are likely to have these habitat properties.
9. Identify the activities most likely to threaten the habitat properties that give the sites their value, and provide information on the extent and consequences of these activities.
10. Quantify how the biological function(s) that specific habitat feature(s) provide to the species varies with the state or amount of the habitat, including carrying capacity limits, if any.
11. Quantify the presence and extent of spatial configuration constraints, if any, such as connectivity, barriers to access, etc.
12. Provide advice on how much habitat of various qualities / properties exists at present.
13. Provide advice on the degree to which supply of suitable habitat meets the demands of the species both at present, and when the species reaches biologically based recovery targets for abundance and range and number of populations.
14. Provide advice on feasibility of restoring habitat to higher values, if supply may not meet demand by the time recovery targets would be reached, in the context of all available options for achieving recovery targets for population size and range.
15. Provide advice on risks associated with habitat "allocation" decisions, if any options would be available at the time when specific areas are designated as critical habitat.
16. Provide advice on the extent to which various threats can alter the quality and/or quantity of habitat that is available.

Scope for Management to Facilitate Recovery

17. Assess the probability that the recovery targets can be achieved under current rates of parameters for population dynamics, and how that probability would vary with different mortality (especially lower) and productivity (especially higher) parameters.
18. Quantify to the extent possible the magnitude of each major potential source of mortality identified in the pre-COSEWIC assessment, the COSEWIC Status Report, information from DFO sectors, and other sources.
19. Quantify to the extent possible the likelihood that the current quantity and quality of habitat is sufficient to allow population increase, and would be sufficient to support a population that has reached its recovery targets.
20. Assess to the extent possible the magnitude by which current threats to habitats have reduced habitat quantity and quality.

Scenarios for Mitigation and Alternative to Activities

21. Using input from all DFO sectors and other sources as appropriate, develop an inventory of all feasible measures to minimize/mitigate the impacts of activities that are threats to the species and its habitat (steps 18 and 20).
22. Using input from all DFO sectors and other sources as appropriate, develop an inventory of all reasonable alternatives to the activities that are threats to the species and its habitat (steps 18 and 20).
23. Using input from all DFO sectors and other sources as appropriate, develop an inventory of activities that could increase the productivity or survivorship parameters (steps 3 and 17).

24. Estimate, to the extent possible, the reduction in mortality rate expected by each of the mitigation measures in step 21 or alternatives in step 22 and the increase in productivity or survivorship associated with each measure in step 23.
25. Project expected population trajectory (and uncertainties) over three generations (or other biologically reasonable time), and to the time of reaching recovery targets when recovery is feasible; given mortality rates and productivities associated with specific scenarios identified for exploration (as above). Include scenarios which provide as high a probability of survivorship and recovery as possible for biologically realistic parameter values.
26. Recommend parameter values for population productivity and starting mortality rates, and where necessary, specialized features of population models that would be required to allow exploration of additional scenarios as part of the assessment of economic, social, and cultural impacts of listing the species.

Allowable Harm Assessment

27. Evaluate maximum human-induced mortality which the species can sustain and not jeopardize survival or recovery of the species.

Expected Publications

- Science Advisory Report
- Proceedings
- Research Document(s)

Participation

- Fisheries and Oceans Canada (DFO) (Ecosystems and Oceans Science, Ecosystems and Fisheries Management, Policy sectors, Habitat and Species at Risk programs)
- Province of Ontario
- Conservation Authorities
- Other invited experts

References

COSEWIC. 2011. COSEWIC assessment and status report on the Silver Shiner *Notropis photogenis* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xi + 45 p.

DFO. 2005. A framework for developing science advice on recovery targets for aquatic species in the context of the *Species at Risk Act*. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2005/054.

DFO. 2007a. Revised Protocol for Conducting Recovery Potential Assessments. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2007/039.

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Shelton, P.A., B. Best, A. Cass, C. Cyr, D. Duplisea, J. Gibson, M. Hammill, S. Khwaja, M. Koops, K. Martin, B. O'Boyle, J. Rice, A. Sinclair, K. Smedbol, D. Swain, L. Velez-Espino, and C. Wood. 2007. Assessing recovery potential: long-term projections and their implications for socio-economic analysis. DFO Can. Sci. Advis. Sec. Res. Doc. 2007/045.

APPENDIX 2. List of Participants

	Name	Affiliation
Sheri	Andres	Fisheries and Oceans Canada - Policy
Dave	Balint,	Fisheries and Oceans Canada - Habitat
Jason	Barnucz	Fisheries and Oceans Canada - Science
Lynn	Bouvier (co-Chair)	Fisheries and Oceans Canada - Science
Shelly	Dunn	Fisheries and Oceans Canada - Species at Risk
Andrea	Dunn	Halton Region Conservation Authority
Scott	Gibson	Ontario Ministry of Natural Resources
Catherine	Jong	Ontario Ministry of Natural Resources
Marten	Koops	Fisheries and Oceans Canada - Science
Nick	Mandrak (co-Chair)	Fisheries and Oceans Canada - Science
Samantha	Mason	Halton Region Conservation Authority
Aurora	McAllister	Ontario Ministry of Natural Resources
Scott	Reid	Ontario Ministry of Natural Resources
Chantelle	Sawatzsky	Fisheries and Oceans Canada - Science
Jon	Schwindt	Upper Thames River Conservation Authority
Sara	Venskaitis	Rapporteur
Jen	Young	Fisheries and Oceans Canada - Science

APPENDIX 3. Agenda

Recovery Potential Assessment of Silver Shiner (*Notropis photogenis*)

Regional Peer Review Meeting – Central and Arctic Region

September 24-25, 2012
Burlington, ON

Co-Chairpersons: Lynn Bouvier and Nicholas Mandrak

24 September (Monday)

Time	Title	Presenter
1:00 p.m.	Welcome and Introductions	Nicholas Mandrak
	Purpose of Meeting	Nicholas Mandrak
	Species Description	Lynn Bouvier
	Population Status	Lynn Bouvier
	Habitat Requirements	Lynn Bouvier
	Functions, Features and Attributes Table	Lynn Bouvier
	Recovery Potential Modeling	Jennifer Young
5:00 p.m.	End of Day	

25 September (Tuesday)

9:00 a.m.	Threat Status	Lynn Bouvier
	Review of Projects and Activities in Silver Shiner Habitat	Dave Balint
	Mitigations and Alternatives	Lynn Bouvier
	Sources of Uncertainty	Lynn Bouvier
	Review of Terms of Reference	Nicholas Mandrak
5:00 p.m.	End of Day	